

FORM PTO-1390 (Modified)  
(REV 11-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

## TRANSMITTAL LETTER TO THE UNITED STATES

P1703USA

DESIGNATED/ELECTED OFFICE (DO/EO/US)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

CONCERNING A FILING UNDER 35 U.S.C. 371

10/018046

INTERNATIONAL APPLICATION NO.

INTERNATIONAL FILING DATE

PRIORITY DATE CLAIMED

PCT/SE00/01208

June 9, 2000

June 10, 1999

TITLE OF INVENTION

A DEVICE IN A LEG PROSTHESIS PROVIDED WITH A FOOT

APPLICANT(S) FOR DO/EO/US

GRAMNAS, FINN

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☒ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☒ is attached hereto.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

## Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☒ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

PCT Request (3 pgs.), Form PCT/IB/308 (1 pg.), Form PCT/IB/332 (1 pg.), check for \$1320.00 and a certificate of mailing

U.S. APPLICATION NO. (IF KNOWN SEE 37 CFR

10/018046

INTERNATIONAL APPLICATION NO.

PCT/SE00/01208

ATTORNEY'S DOCKET NUMBER

P1703USA

24. The following fees are submitted:

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5)) :**

- ☒ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... \$1040.00
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$890.00
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$740.00
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$710.00
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$100.00

**ENTER APPROPRIATE BASIC FEE AMOUNT =****CALCULATIONS PTO USE ONLY**

\$1,040.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

\$0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	10 - 20 =	0	x \$18.00
Independent claims	1 - 3 =	0	x \$84.00

\$0.00

\$0.00

Multiple Dependent Claims (check if applicable).

☒

\$280.00

**TOTAL OF ABOVE CALCULATIONS =**

\$1,320.00

☐ Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.

\$0.00

**SUBTOTAL =**

\$1,320.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

\$0.00

**TOTAL NATIONAL FEE =**

\$1,320.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable).

☐

\$0.00

**TOTAL FEES ENCLOSED =**

\$1,320.00

Amount to be:

\$

charged

\$

- a. ☒ A check in the amount of \$1,320.00 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \_\_\_\_\_ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 07-0181 A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

SIGNATURE

Michael M. Geoffrey

NAME

41,775

REGISTRATION NUMBER

December 7, 2001

DATE

10/018046

J007 Rec'd PCT/PTO 07 DEC 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Gramnas, Finn )  
Serial No.: Not yet assigned ) Examiner:  
Filed: Herewith ) Group Art Unit:  
For: A Device In A Leg Prosthesis )  
Provided With A Foot )

Commissioner for Patents  
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to initial examination, please amend the above-identified U.S. patent application which is being filed claiming priority of International Publication Number PCT/SE00/01208 filed on June 9, 2000, which claims priority to Swedish application, 9902193-3, filed June 10, 1999. Claim amendments are as indicated on the enclosed Amended Claims Marked to Show Changes Made 37 CFR 1.121 (c)(1)(ii) and Amended Claims 37 CFR 1.121 (c)(3).

The above amendments are made to remove drawing component numbers from the claims.

Examination of the application as amended is respectfully requested.

Date: December 7, 2001

Respectfully submitted,

  
Michael M. Geoffrey, Reg. No. 41,775

GARDNER, CARTON & DOUGLAS  
321 N. Clark Street, Suite 3400  
Chicago, Illinois 60610-4795  
Tel: 312-644-3000  
Fax: 312-644-3381

(P1703USA)

2005094087001

**AMENDED CLAIMS MARKED TO SHOW CHANGES MADE**  
**37 CFR 1.121(c)(1)(ii)**

1 (Amended). Arrangement for a leg prosthesis [(10)] provided with a foot [(12)], which is connected to the leg prosthesis via an articulated axle [(11)], whereby first means [(13, 14, 16-18, 30-33, 38)] are arranged to provide a limited rotation of the foot relative the leg prosthesis from an initial position, in which position the leg prosthesis and the foot have a fixed angle relative each other, and second means [(16-26)] are arranged to provide a step-less adjustment of the angle between the leg prosthesis and the foot in the initial position,

*characterized in,*

that the first means [(13, 14, 16-18, 30-33, 38)] comprise a resilient element [(14)], which first end thereof is connected to the foot [(12)] via an elongated element [(13)] and which second end is connected to the leg prosthesis so that the leg prosthesis can be rotated relative the foot against the effect of the spring force of the resilient element.

2 (Amended). Arrangement according to claim 1,

*characterized in,*

that the second means [(16-26)] comprise an element [(17)], which is displaceable relative the leg prosthesis [(10)], and means [(18, 21)] to hold the displaceable element in a desired displacement position, whereby the displaceable element, set in its initial position, in one end bears on a portion [(38)] of the foot [(12)] and in its second end on the resilient element [(14)].

3 (Amended). Arrangement according to claim 2,

*characterized in,*

that the displaceable means comprise a piston [(17)] with outwardly directed ring flanges, which piston is displaceably arranged in a cylinder [(16)] attached to the leg prosthesis [(10)], and the means for holding the piston in desired displacement position relative the cylinder comprise a ring wall [(18)] projecting inwards from the cylinder, which wall divides the space between the ring flanges of the piston in two chambers, and a two-way

20250908T001

valve [(21)], which in opened position provides flow of the medium existing in the chambers between these and in closed position prevents such flow.

4 (Amended). Arrangement according to claim 3,

*characterized in,*

that the elongated element [(13)] extends through a central axial channel [(29)] in the piston [(17)] and through a central axial passage in the resilient element and is connected, via a washer [(33)] of rigid material, to that end of the resilient element [(14)], which is opposite the end which bears on the piston.

5 (Amended). Arrangement according to any of the preceding claims,

*characterized in,*

that the elongated element is constituted by flexible material.

6 (Amended). Arrangement according to claim 5,

*characterized in,*

that the elongated element [(13)] is constituted by a cord or wire or of a belt of a material with little extensibility.

**Amended Claims**  
**37 CFR 1.121(c)(3)**

1 (Amended). Arrangement for a leg prosthesis provided with a foot, which is connected to the leg prosthesis via an articulated axle, whereby first means are arranged to provide a limited rotation of the foot relative the leg prosthesis from an initial position, in which position the leg prosthesis and the foot have a fixed angle relative each other, and second means are arranged to provide a step-less adjustment of the angle between the leg prosthesis and the foot in the initial position,

*characterized, in*

that the first means comprise a resilient element, which first end thereof is connected to the foot via an elongated element and which second end is connected to the leg prosthesis so that the leg prosthesis can be rotated relative the foot against the effect of the spring force of the resilient element.

2 (Amended). Arrangement according to claim 1,

*characterized in,*

that the second means comprise an element, which is displaceable relative the leg prosthesis, and means to hold the displaceable element in a desired displacement position, whereby the displaceable element, set in its initial position, in one end bears on a portion of the foot and in its second end on the resilient element.

3 (Amended). Arrangement according to claim 2,

*characterized in,*

that the displaceable means comprise a piston with outwardly directed ring flanges, which piston is displaceably arranged in a cylinder attached to the leg prosthesis, and the means for holding the piston in desired displacement position relative the cylinder comprise a ring wall projecting inwards from the cylinder, which wall divides the space between the ring flanges of the piston in two chambers, and a two-way valve, which in opened position

2020509408T001

provides flow of the medium existing in the chambers between these and in closed position prevents such flow.

4 (Amended). Arrangement according to claim 3,

*characterized in,*

that the elongated element extends through a central axial channel in the piston and through a central axial passage in the resilient element and is connected, via a washer of rigid material, to that end of the resilient element, which is opposite the end which bears on the piston.

5 (Amended). Arrangement according to any of the preceding claims,

*characterized in,*

that the elongated element is constituted by flexible material.

6 (Amended). Arrangement according to claim 5,

*characterized in,*

that the elongated element is constituted by a cord or wire or of a belt of a material with little extensibility.

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
21 December 2000 (21.12.2000)

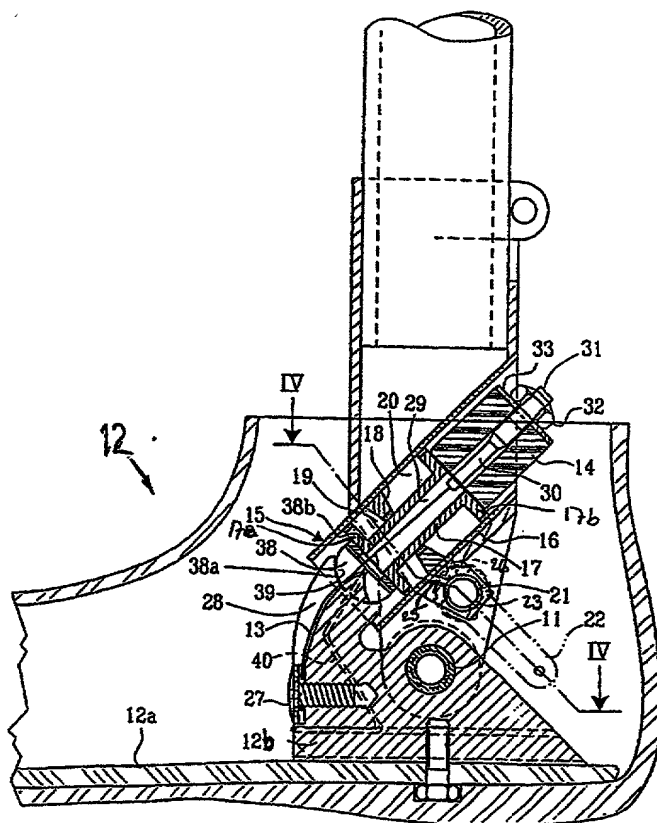
PCT

(10) International Publication Number  
**WO 00/76429 A1**

- (51) International Patent Classification<sup>7</sup>: **A61F 2/66** (74) Agent: **GÖTEBORGS PATENTBYRÅ DAHLS AB**; Sjöporten 4, S-417 64 Göteborg (SE).
- (21) International Application Number: **PCT/SE00/01208**
- (22) International Filing Date: **9 June 2000 (09.06.2000)** (81) Designated States (*national*): AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KR (utility model), KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (25) Filing Language: **Swedish**
- (26) Publication Language: **English**
- (30) Priority Data: **9902193-3** **10 June 1999 (10.06.1999)** **SE**
- (71) Applicant (*for all designated States except US*): **GRAMTEC INNOVATION AB [SE/SE]; Strömbacken 1, S-511 56 Kinna (SE).**
- (72) Inventor; and
- (75) Inventor/Applicant (*for US only*): **GRAMNÄS, Finn [SE/SE]; Hästskovägen 5, S-511 56 Kinna (SE).** *SEX*
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,

[Continued on next page]

(54) Title: A DEVICE IN A LEG PROSTHESIS PROVIDED WITH A FOOT



(57) Abstract: The present invention relates to an arrangement for a leg prosthesis (10) provided with a foot (12), which is connected to the leg prosthesis via an articulated axle (11), whereby first means (13, 14, 16-18, 30-33, 38) are arranged to provide a limited rotation of the foot relative the leg prosthesis from an initial position, in which position the leg prosthesis and the foot have a fixed angle relative each other, and second means (16-26) are arranged to provide a step-less adjustment of the fixed angle between the leg prosthesis and the foot in the initial position. According to the invention the first means (13, 14, 16-18, 30-33, 38) comprise a resilient element (14), which first end thereof is connected to the foot (12) via an elongated element (13) and which second end is connected to the leg prosthesis so that the leg prosthesis can be rotated relative the foot against the effect of the spring force of the resilient element.

WO 00/76429 A1

20/050-9408FOOT



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: F. Gramnas )  
 Serial No.: 10/018,046 ) Examiner: n/a  
 Filed: December 7, 2001 ) Group Art Unit: n/a  
 For: A DEVICE IN A LEG PROSTHESIS PROVIDED WITH A FOOT

ASSERTION OF ENTITLEMENT TO SMALL ENTITY STATUS  
 (37 C.F.R. §1.27(c)(1))

Commissioner for Patents  
 Washington, D.C. 20231

Sir:

Applicant hereby states that applicant is a small entity and that status as a small entity is asserted for this application.

Respectfully submitted,

Date: May 7, 2002

By: Connie B. Berg  
 Connie B. Berg, Reg. No. 46,548  
 Attorney for Applicant

GARDNER CARTON & DOUGLAS  
 321 North Clark Street  
 Suite 3400  
 Chicago, IL 60610  
 Telephone: 312-644-3000  
 Facsimile: 312-644-3381  
 Customer No. 08968

CERTIFICATE OF MAILING

I hereby certify that this Assertion of Entitlement To Small Entity Status (37 C.F.R. §1.27(c)(1)) is being deposited with the United States Postal Service with sufficient postage as Express Mail in an envelope addressed to: Commissioner for Patents, Washington D.C., 20231 on May 7, 2002. (Express Mail No. EJ948920149US)

Carol E. Arellano  
 Carol E. Arellano

202050-94081001

3/PRTS

10/018046  
J207 Rec'd PCT/PTO 07 DEC 2001

## A DEVICE IN A LEG PROSTHESIS PROVIDED WITH A FOOT

### TECHNICAL FIELD

The present invention relates to a device in a leg prosthesis provided with a foot, which is  
5 connected to the leg prosthesis via an articulated axle, whereby first means are arranged to  
provide a limited rotation of the foot relative the leg prosthesis from an initial position, in which  
position the leg prosthesis and the foot have a fixed angle relative each other, and second means  
are arranged to provide a step-less adjustment of the fixed angle between the leg prosthesis and  
the foot in the initial position.

### BACKGROUND OF THE INVENTION

It is well known among prosthesis wearers that downhill walking is problematic. If the  
15 prosthesis wearer does not have the possibility of adjusting the angle of the foot, the walk  
downhill gets such that only the heel has contact with the ground. Above a certain degree of foot  
angle it is difficult to bear up the body weight so that the knee does not collapse because of the  
lack of essential groups of muscles. Therefore, prosthesis wearers often choose to walk  
sideways when walking downhills.

Further, prosthesis wearers who, have not got a foot which is vertically adjustable, have  
20 problems changing to another shoe with a different heel height, and to rapidly choose to walk  
without shoes. Individual, vertical adjustment of the foot even reduces problems with pain in the  
back and worn out hips.

Through for instance US patent document 2,749,557 is known an adjustable foot, however it is  
25 only adjustable to three different angular positions.

Furthermore, SE-B-456 134 shows a prosthesis foot where the angular positions of the foot are  
adjusted with a screw existing in the heel of the foot. The prosthesis wearer must turn the screw  
a number of turns to change the angle position, which requires a certain work effort. The  
30 principle of changing the angle shown in this document has the great disadvantage that the length

of the leg changes, which results in that the prosthesis wearer can have one leg shorter or longer than the other in certain situations.

Further, SE-B-469 780 shows an additional example of a prosthesis foot where the angle position of the foot can be adjusted, in this case using a ball screw and ball nut.

Furthermore, WO 96/25989 shows a device of the kind mentioned in the preamble.

The invention relates to a device of the kind mentioned in the preamble, which can easily be adjusted to the weight and walk pattern of the prosthesis wearer and which is reliable and simple and cheap to manufacture.

#### SUMMARY OF THE INVENTION

This aim is achieved by means of a device in a leg prosthesis provided with a foot, which is connected to the leg prosthesis via an articulated axle, whereby first means are arranged to allow a limited rotation of the foot relative the leg prosthesis from an initial position, in which position the leg prosthesis and the foot have a fixed angle relative each other, and second means are arranged to provide a step-less adjustment of the fixed angle between the leg prosthesis and the foot in the initial position, characterized in that the first means comprise a resilient element, which first end thereof is connected to the foot via a elongated element and which second end is connected to the leg prosthesis so that the leg prosthesis can be rotated relative the foot against the effect of the spring force of the resilient element.

In a preferred embodiment the second means comprise a displaceable element, which is displaceably arranged relative the leg prosthesis, and means to hold the displaceably arranged element in a desired displacement position, whereby the displaceable element, set in its initial position, in one end bears on a portion of the foot and in its other end on the resilient element. The displaceable means is formed by a piston with outwardly directed ring flanges, which piston is displaceably arranged in a cylinder attached to the leg prosthesis, and the means for holding the piston in a desired displacement position relative the cylinder is formed by a ring wall projecting inwards from the cylinder, which wall divides the space between the ring flanges of the piston in

two chambers, and a two-way valve, which in opened position provides flow of the medium existing in the chambers between these and in closed position prevents such flow. The elongated element extends through a central axial channel in the piston and through a central axial passage in the resilient element and is connected, via a washer of rigid material, to that end of the resilient element, which is opposite the end which bears on the piston. The elongated element constitutes of flexible material and can be made of a cord or wire or of a belt of a material with little extensibility.

## LIST OF DRAWINGS

In the following the invention will be described with reference to enclosed figures, in which; Figure 1 shows a longitudinal cross section through a foot and leg prosthesis according to an embodiment of the invention in unloaded position, Figure 2 shows a section corresponding to Figure 1, but in another initial position for the angle between foot and leg prosthesis, Figure 3 shows the foot and leg prosthesis according to Figure 1 just after the foot prosthesis has been set down, and Figure 4 is a section along line IV-IV in Figure 1.

## DESCRIPTION OF EMBODIMENTS

The Figures show a leg prosthesis 10 in the form of cylindrical tube frame, which via an articulated axle 11, forming an ankle joint, is connected to a portion 12b of a foot 12. The foot 12 can be provided with a foot blade 12a, which can be provided with foot cosmetics. The flexible element 13 in the form of a cord, wire or belt or similar is eccentrically attached to the portion 12b of the foot relative its articulated axle 11. The cord 13 runs through a central channel 29 running through a piston 17 and is attached to a nipple 30 with its second end, which nipple 30 extends through a central passage in an elastic body 14. A screw 31 is threaded into the nipple 30 and a nut 32 is screwed on the outside of the screw. Preferably, a washer 33 of metal or other rigid material is provided between the nut 32 and the elastic body 14. Suitably, the cord 13 has such a length that the elastic body 14 is restrained between one end 17b of the piston 17 and the washer 33 in a somewhat compressed state. Figure 1 shows the shank and the foot in the initial position, in which the angle between these parts is about 90°. In the initial

position the end 17a of the piston 17 bears onto a half spherical body 38, which rests in a cup-shaped recess in the foot portion 12b.

The piston 17 and the elastic body 14 extend inside a cylinder 16, which diagonally extends through the lower part of the leg prosthesis above the articulated axle 11. The ends 17a, 17b of the piston 17 are formed by outwardly directed ring flanges, which edges sealingly bear against the wall of the cylinder 16. The cylinder 16 has an inwardly directed ring wall 18, which is arranged between the ring flanges of the piston 17 and which sealingly bears against the tube wall of the piston 17. The ring wall 18 of the cylinder and the respective ring flanges 17a, 17b of the piston delimit two ring chambers 19, 20, which are filled with hydraulic medium. These ring chambers can communicate with each other by means of an overflow valve 21. The overflow valve 21 is adjustable between opened and closed position by means of an adjustable lever 22 on the outside of the leg prosthesis.

In the shown embodiment, the overflow valve 21 is formed by a rotatable cylindric valve body with two openings 23 and 24, which in the opened position of the valve (Fig. 1) are facing and communicating via holes 25 and 26 in the wall of the cylinder with one chamber 19 and 20 respectively each. Thus, the chambers communicate with each other in this position and overflow of hydraulic medium can exist between the chambers. In another position, which is shown in Fig. 2, 3 and 4, the valve 21 is closed whereby the openings 23 and 24 are facing away from the holes 25 and 26.

One end of the cord 13 is attached to the front portion of the foot portion 11 by means of an attachment screw 27 and runs through a curved slot 28 in said portion, which works as direction changer. The cord 13 further runs through the half spherical body 38, which has a curved surface 38a, which cooperates with and can rotate in a cup-shaped support surface 39 at the foot portion 12, and a plane surface 38b, which cooperates with the end 17a of the piston 17. The body 38 is kept in place in the foot portion 12a by means of a spring 40. In the initial position according to Fig. 1, the end surface 17a of the piston 17 is pressed into contact with the plane surface 38b of the body 38 because of the preload of the resilient element 14, which is effected by the restrain thereof between the piston 17 and the washer 33. The foot is also substantially

unloaded in the heel portion. In the position shown in Figure 1, the cylinder 16 is displaceable relative the piston 17. After the lever 22 has been brought up to the closed position of the valve 21, the piston 17 can no longer be displaced relative the cylinder 16 and the leg prosthesis provided with a foot is in its usage position.

5

When setting down a foot during walk, the heel is first set down and thereafter the weight is successively brought over to that foot, which was just set down. In the position shown in Fig. 3 the foot has just been set down and the transfer of weight has just begun. During the transfer of weight to the set down leg, the upward force on the heel will generate a moment, such as is indicated with arrows in Fig. 3, that by effect of the spring force in the resilient element 14 will rotate the foot downwards until the foot blade comes into contact with the ground. In this case, the elastic body 14 works as a shock absorber that absorbs the force that arise when the heel is set down. The maximum angle that the leg prosthesis can form against the foot in the set down position in Fig. 3, is limited by the maximum possible compression of the elastic element 14. The angle that the leg prosthesis should be able to form against the foot in the set down position of Fig. 3 to provide a comfortable walk, is dependent of the length of the steps of the prosthesis wearer. The shock absorbing effect of the resilient element depends on the weight and walk pattern of the prosthesis wearer. The resilient element 14 working as shock absorber can be individually adjusted by preload that is achieved by means of varying the tightening of the nut 32 and by choosing maximum length of compression of the element. As the resilient element is easy to remove and put back, it can easily be changed to another element, which is more suitable for the body weight and walk pattern of the prosthesis wearer. Resilient elements that are worn out can easily be changed to new ones.

25 An unloaded foot will automatically be displaced to the initial position because of the fact that the resilient element 14 always aims to come into its expanded position.

If it is desired to change the initial position, i. e change the angle between the leg prosthesis 10 and the foot 12, e. g when changing to shoes with high heels, the overflow valve 21 is opened by means of the lever 22, whereby an overflow of hydraulic medium can exist between the chambers 19 and 20. This entails the cylinder 16 to be continuous displaced relative the piston

17 and the resilient element 14, which permits the leg prosthesis to be rotated relative the foot within the limits of possible displacement of the ring wall 18 of the cylinder 16 in the chambers 19, 20.

5 At the same time as the displacement of the cylinder relative the piston, the cylinder will be rotated around the articulated axle 11, which is followed by a rotation of the body 38, the piston 17 and the resilient element 14. The position of the cord 13 in the channel 29 will also change, as is shown in the Fig. 2. The diameter of the channel 29 is adjusted to permit the relative change in position of the cord 13. When a desired angle between the leg prosthesis and the foot has been  
10 reached, the valve 21 is closed.

In practice, adjustment to a new initial position is made through that the shoe with high heel is put on the foot, whereby the valve is opened. The leg prosthesis is then placed in a vertical position and the valve is closed.

15 In the embodiments shown in the Figures, the resilient element 14 constitutes of an elastic body 14 of e. g rubber or other elastic polymeric material. Within the scope of the invention it is of course possible to use other types of resilient bodies, e. g helical or cup springs. The resilient element 13 is formed by a material which does not stretches due to the loads which normally  
20 exist during usage of leg prostheses and can be made of steel, plastic or textile material.

25 Naturally, modifications of the invention are possible within the scope of the invention. For example, the valve 21 could be manoeuvrable by an electric motor, e. g a step motor, and the leg prosthesis could comprise a battery and a switch, which can be placed so that it is easy to reach for the prosthesis wearer. Furthermore, the piston 17 could be replaced by a rigid sleeve, which runs in a cylinder provided with a slit, which cylinder is provided with a device for clamping the cylinder against the sleeve. Nor is it necessary that the element 13 is resilient, the cord 13 can instead be replaced with a rod or the like which is articulated to the body 38 and the nipple 30. Therefore, the invention should only be limited to the contents of the appending claims.

## CLAIMS

5 1. Arrangement for a leg prosthesis (10) provided with a foot (12), which is connected to the leg prosthesis via an articulated axle (11), whereby first means (13, 14, 16-18, 30-33, 38) are arranged to provide a limited rotation of the foot relative the leg prosthesis from an initial position, in which position the leg prosthesis and the foot have a fixed angle relative each other, and second means (16-26) are arranged to provide a step-less adjustment of the  
10 angle between the leg prosthesis and the foot in the initial position,

*characterized in,*

that the first means (13, 14, 16-18, 30-33, 38) comprise a resilient element (14), which first end thereof is connected to the foot (12) via an elongated element (13) and which second end is connected to the leg prosthesis so that the leg prosthesis can be rotated  
15 relative the foot against the effect of the spring force of the resilient element.

2. Arrangement according to claim 1,

*characterized in,*

that the second means (16-26) comprise an element (17), which is displaceable relative the leg prosthesis (10), and means (18, 21) to hold the displaceable element in a desired displacement position, whereby the displaceable element, set in its initial position, in one  
20 end bears on a portion (38) of the foot (12) and in its second end on the resilient element (14).

3. Arrangement according to claim 2,

*characterized in,*

that the displaceable means comprise a piston (17) with outwardly directed ring flanges, which piston is displaceably arranged in a cylinder (16) attached to the leg prosthesis (10), and the means for holding the piston in desired displacement position relative the cylinder  
25 comprise a ring wall (18) projecting inwards from the cylinder, which wall divides the  
30



space between the ring flanges of the piston in two chambers, and a two-way valve (21), which in opened position provides flow of the medium existing in the chambers between these and in closed position prevents such flow.

5 4. Arrangement according to claim 3,

*characterized in,*

that the elongated element (13) extends through a central axial channel (29) in the piston (17) and through a central axial passage in the resilient element and is connected, via a washer (33) of rigid material, to that end of the resilient element (14), which is opposite  
10 the end which bears on the piston.

5. Arrangement according to any of the preceding claims,

*characterized in,*

that the elongated element is constituted by flexible material.  
15

6. Arrangement according to claim 5,

*characterized in,*

that the elongated element (13) is constituted by a cord or wire or of a belt of a material with little extensibility.  
20

25

30

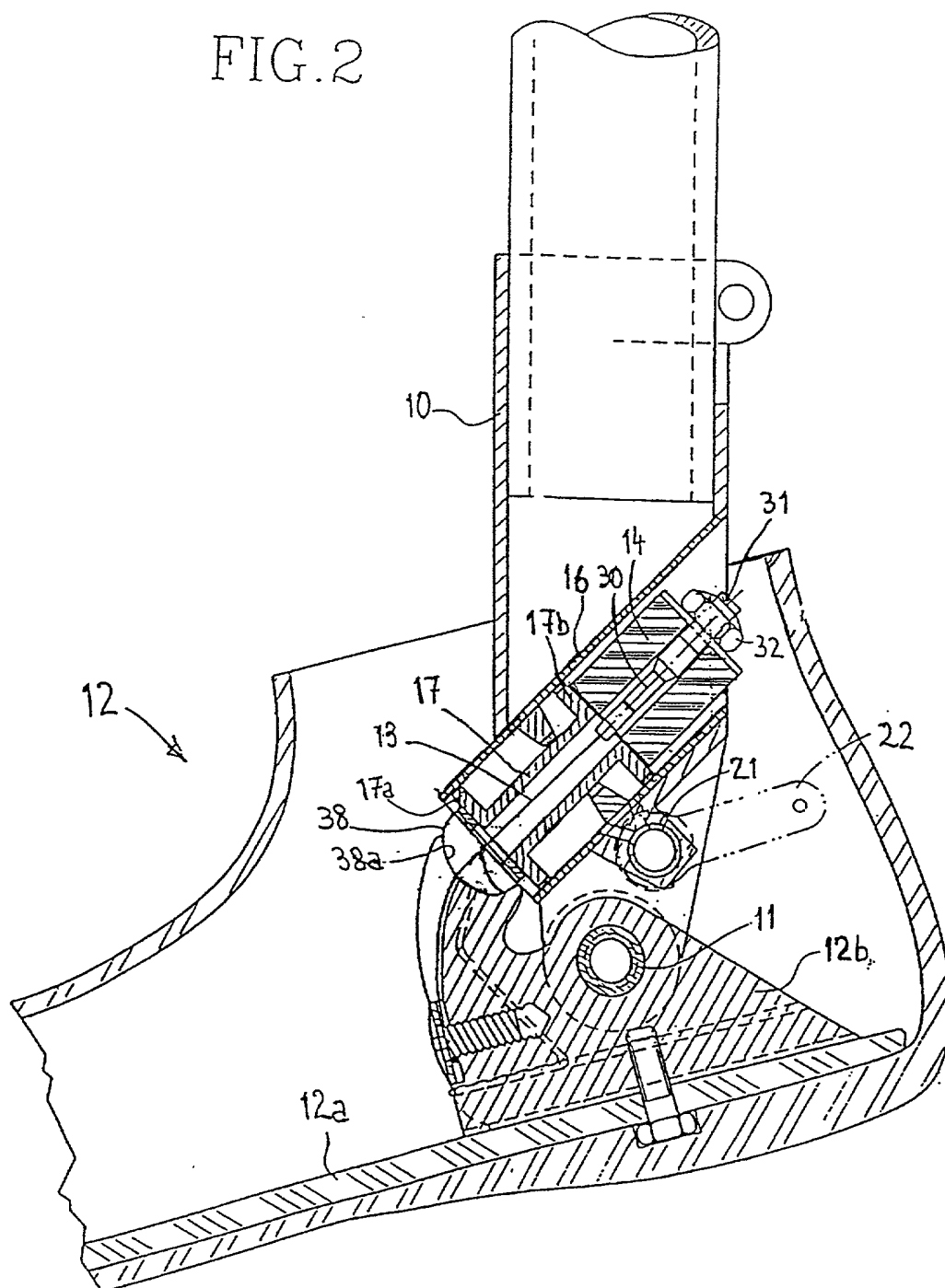
## ABSTRACT

The present invention relates to an arrangement for a leg prosthesis (10) provided with a foot (12), which is connected to the leg prosthesis via an articulated axle (11), whereby first  
5 means (13, 14, 16-18, 30-33, 38) are arranged to provide a limited rotation of the foot relative the leg prosthesis from an initial position, in which position the leg prosthesis and the foot have a fixed angle relative each other, and second means (16-26) are arranged to provide a step-less adjustment of the fixed angle between the leg prosthesis and the foot in the initial position. According to the invention the first means (13, 14, 16-18, 30-33, 38) comprise a resilient element  
10 (14), which first end thereof is connected to the foot (12) via an elongated element (13) and which second end is connected to the leg prosthesis so that the leg prosthesis can be rotated relative the foot against the effect of the spring force of the resilient element.

CH02/22161141.1



FIG. 2





# DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter, which is claimed and for which a patent is sought on the invention entitled: **"A device in a leg prosthesis provided with a foot"**

the specification of which

☐ is attached hereto.

☒ was filed on December 7, 2001 as United States Application Number or PCT International Application Number 10/018,046 and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 (a)-(d) of any foreign application(s) for patent or inventor's certificate or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed:

Prior foreign application(s)			
Country	Application Number	Date of Filing (day/month/year)	Priority Claimed
Sweden	9902193-3	10.06.1999	YES [X]    NO [ ]
			YES [ ]    NO [ ]

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

Application Number:                      Filing Date:  
Application Number:                      Filing Date:

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

U.S. Parent Application Serial Number:                      Parent Filing Date:                      Parent Patent No:

U.S. Parent Application Serial Number:                      Parent Filing Date:                      Parent Patent No:

PCT Parent Number: **PCT/SE00/01208**                      Parent Filing Date: **09.06.2000**

POWER OF ATTORNEY: I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

**GARDNER, CARTON & DOUGLAS**  
**QUAKER TOWER**  
**321 NORTH CLARK STREET**  
**CHICAGO, IL 60610-4795**  
**USA**

**Telephone: + 1 312 644 3000**  
**Facsimile: + 1 312 644 3381**

202050-91031001

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole first inventor (given name, family name): Finn Gramnäs

Inventor's signature: Finn Gramnäs

Date: 6/12-01

Residence: Hästskovägen 5

Citizenship: Swedish

Post Office address: S-511 56 KINNA, Sweden

Full name of second joint inventor (given name, family name):

Inventor's signature:

Date:

Residence:

Citizenship:

Post Office address:

Full name of third joint inventor (given, name, family name):

Inventor's signature:

Date:

Residence:

Citizenship:

Post Office address:

Full name of fourth joint inventor (given, name, family name):

Inventor's signature:

Date:

Residence:

Citizenship:

Post Office address:

☐ Additional inventor's are being named on separately numbered sheets attached hereto.

10013046-050702